IN THE CLAIMS

Please amend the claims as indicated: 1. Canceled

2. (currently amended) In a method for determining a fracture pressure gradient of a subsurface region of earth formations comprising:

(a) obtaining seismic survey information about the subsurface region;

(b) identifying a plurality of ~~interpreted~~ seismic horizons ~~of interest~~ from the obtained survey information;

(c) obtaining estimated seismic velocities corresponding to at least one interval between at least one pair of said plurality of seismic horizons;

(d) calibrating the estimated seismic velocities to the parameter of interest

(e) using the results of said calibration and the obtained seismic velocities to obtain said fracture pressure gradient at any location within the seismic survey;

an improvement comprising displaying the parameter of interest on one of:

(i) P- or S-wave velocity displays;

(ii) P-wave impedance displays;

(iii) S-wave impedance displays;

(iv) P-wave frequency attribute displays;

(v) S-wave frequency attribute displays;

(vi) P-wave phase attribute displays;

(vii) S-wave phase attribute displays;

(viii) density displays;

(ix) P-wave amplitude attribute displays;

(x) S-wave amplitude attribute displays.

3. Canceled

4. Canceled.

5. (new) A computer system implementing a computer program comprising instructions for:

(a) accessing subsurface seismic data that is at least one of:

(A) a 2-D seismic line, and

(B) a 3-D seismic volume,

corresponding to a subsurface region;

(b) displaying, editing and datuming a well log associated with the subsurface region and fitting a calibration curve to the log;

(c) predicting fluid and rock pressures in the subsurface region based at least in part on the subsurface seismic data and results of the fitting; and

(d) displaying results of the prediction.

6. (new) The computer system of claim 5 further comprising instructions for

(i) identifying a plurality of seismic horizons from the subsurface seismic data;

(ii) obtaining estimated seismic velocities corresponding to at least one interval between at least one pair of said plurality of seismic horizons;

(iii) calibrating the estimated seismic velocities to the parameter of interest

7. (new) The computer system of claim 6 further comprising instructions for:

calibrating the estimated seismic velocities using at least one of:

(A) a function determined independently from the seismic data using regional information;

(B) data from a well corresponding to a specific calibration location that is outside the areal extent of the seismic velocity data; and

(C) data from a well corresponding to a specific calibration location within the areal extent of the seismic velocity data; and

(D) data from a well corresponding to a specific calibration location within the areal extent of the seismic velocity data combined with the velocity data from the seismic survey for the same said location.

8. (new) The computer system of claim 7 further comprising instructions for calibrating the estimated seismic velocities based on estimation of an overburden-depth relationship that is determined by integrating density data from at least one of:

I. a 1-D density function derived from density logs from at least one well;

II. a 1-D density function derived from density data from drop cores, side-wall cores or conventional cores;

III. a spatially varying density function based on the inversion of potential fields data, said potential fields data comprising at least one of gravity

data, and magnetic data;

IV. a density function derived by performing inversion of at least one of PP data, and PS data.

9. (new) The computer system of claim 6 further comprising instructions for estimating the seismic velocities using at least one of:

(A) Dip Move out (DMO),

(B) Pre-stack time migration,

(C) Pre-stack depth migration,

(D) Multiple attenuation or suppression,

(E) Reflection statics,

(F) Refraction statics,

(G) Wavefield reconstruction, and

(H) combining undersampled seismic data from several gathers to form super-gathers.

10. (new) The computer system of claim 5 wherein the parameter of interest is selected from the group consisting of: (i) fluid pressure, (ii) fracture pressure, (iii) overburden pressure, (iv) effective stress, and, (v) excess pressure, defined as the difference between the actual fluid pressure and the normal pressure for the same depth.

11. (new) The computer system of claim 10 further comprising instructions for performing further analysis at one of the following scales:

A. the scale of a specific well location, defined as a projected one-dimensional path that will be used to place a wellbore into the subsurface,

B. the scale of an exploration prospect, and

C. the scale of a regional pressure evaluation to understand hydrocarbon systems.

12. (new) The computer system of claim 10 further comprising instructions for performing specific analyses of the subsurface including at least one of the following:

A. basin modeling,

B. hydrocarbon maturation in source rock intervals,

C. lateral and vertical seal rock integrity,

D. fault seal integrity,

E. evaluation of fluid migration pathways in the subsurface,

F. reservoir-specific lateral pressure changes,

G. shallow water flow risk evaluation, and

H. wellbore stability and failure analysis.

13. (new) The computer system of claim 5 wherein the seismic data is selected from the group consisting of: (i) P-wave land seismic data, (ii) S-wave land seismic

data, (iii) mode-converted S-wave land data (land PS data), (iv) mode-converted S-wave marine ocean-bottom cable data (marine PS data), (v) P-wave marine streamer data, and, (vi) P-wave marine ocean bottom cable data (PP data).

14. (new) The computer system of claim 6 further comprising instructions for estimating the seismic velocities from the group consisting of:

(A) P-wave velocity data generated from normal moveout (NMO) velocity analysis,

(B) P-wave or S-wave velocity data generated from coherency inversion analysis,

(C) P-wave velocity generated from pre-stack inversion,

(D) P-wave velocity generated from post-stack inversion,

(E) S-wave velocity generated from pre-stack inversion,

(F) S-wave velocity generated from post-stack inversion,

(G) S-wave velocity data generated from normal moveout (NMO) velocity analysis,

(H) P-wave velocity generated from tomography,

(I) S-wave velocity generated from tomography,

(J) P-wave velocity data from vertical seismic profiling (VSP),

(K) P-wave velocity data from VSP look-ahead inversion,

(L) S-wave velocity data from vertical seismic profiling (VSP), and

(M) S-wave velocity data from VSP look-ahead inversion.

15. (new) The computer system of claim 7 wherein the data from a well comprises at least one of:

I. sonic logs,

II. shear sonic logs,

III. density logs,

IV. Lithology logs in the form of gamma ray or Spontaneous Potential logs,

V. formation fluid pressure data,

and

VII. Leak off test data

16. (new) The computer system of claim 5 further comprising instructions for implementing at least one of:

(i) the Eaton method,

(ii) the effective stress method, and

(iii) the equivalent depth method.

17. (new) The computer system of claim 6 further comprising instructions for calibrating the estimated seismic velocities using at least one of:

(A) a linear curve fitting,

(B) a curve fitting based on a power law,

(C) a curve fitting based on exponentials, and

(D) a quadratic curve fitting.

18. (new) The computer system of claim 17 further comprising instructions for calibrating the estimated seismic velocities that enable use of an interactive display, the interactive display allowing modification of a displayed calibration curve and observing changes in a plurality of other displayed curves simultaneously, the interactive display further allowing at least one of:

I. manually changing a coefficient or exponent in the fitting equation, and

II. using a cursor to graphically manipulate the fitting curve.

19. (new) The computer system of claim 5 further comprising instructions for obtaining a porosity calibration curve using at least one of:

(i) editing of erroneous porosity values for at least one well;

(ii) displaying in a single plot, a depth-correlated porosity and velocity data for the at least one well;

(iii) curve fitting of the velocity and porosity data using at least one of:

I. a linear curve fitting,

II. a curve fitting based on a power law,

III. a curve fitting based on exponentials, and

IV. a quadratic curve fitting.

20. (new) The computer system of claim 5 further comprising instructions fo displaying

the parameter of interest on one of:

(i) stacked seismic section, and

(ii) migrated seismic section.

21. (new) The computer system of claim 5 further comprising instructions for enabling display of the parameter of interest interactively and simultaneously on at least one of:

(i) a seismic display;

(ii) a velocity versus depth display including a velocity function for a specific location and a calibration function for velocity versus effective stress,

(iii) a stress versus depth display including the overburden stress calibration for said specific location and the effective stress calculated from the velocity versus depth display,

(iv) a pressure-gradient versus depth display including the fracture gradient or overburden gradient, the fluid pressure gradient calculated from the stress versus depth display, and pressure data points from a well that applies to said specific location.

22. (new) The computer system of claim 5 further comprising instructions enabling at least one of:

(i) deletion or correction for zones of abnormal velocity caused by the presence of hydrocarbon fluids; and

(ii) deletion of zones of abnormal velocity caused by the presence of nonclastic rocks.

23. (new) The computer system of claim 5 further comprising instructions for at least one of:

(i) determining an overburden stress from a density function based on inversion of 2-D or 3-D potential fields;

(ii) determining an overburden stress from a density function derived by performing a simultaneous inversion of PP and PS data;

(iii) correcting for zones of abnormal density caused by the presence of hydrocarbon fluids by inserting a correct density for said zones and recalculating the overburden at the specific location;

(iv) correcting for zones of abnormal velocity caused by the presence of hydrocarbon fluids by deleting said zones from the calculation of the parameter of interest;

(v) correcting for zones of abnormal density caused by the presence of non-clastic rocks by inserting a correct density for said zones and recalculating the overburden at the specific location; and

(vi) correcting for zones of abnormal velocity caused by the presence of non-clastic rocks by deleting said zones from the calculation of the parameter of interest.

24. (new) The computer system of claim 6 further comprising instructions for estimation of an overburden-depth relationship that is determined by integrating density data obtained by inversion of 2-D or 3-D potential fields data.

25. (new) The computer system of claim 6 further comprising instructions for estimation of an overburden-depth relationship by integrating density data obtained by inversion of at least one of 2-D or 3-D seismic data, and wherein said seismic data further comprise at least one of PP data and PS data.

26. (new) A machine readable medium comprising instructions for:

(a) accessing subsurface seismic data that is at least one of:

(A) a 2-D seismic line, and

(B) a 3-D seismic volume,

corresponding to a subsurface region;

(b) displaying, editing and datuming a well log associated with the subsurface region and fitting a calibration curve to the log;

(c) predicting fluid and rock pressures in the subsurface region based at least in part on the subsurface seismic data and results of the fitting; and

(d) displaying results of the prediction.

27. (new) The machine readable medium of claim 26 further comprising instructions for

(i) identifying a plurality of seismic horizons from the subsurface seismic data;

(ii) obtaining estimated seismic velocities corresponding to at least one interval between at least one pair of said plurality of seismic horizons;

(iii) calibrating the estimated seismic velocities to the parameter of interest

28. (new) The machine readable medium of claim 27 further comprising instructions for:

calibrating the estimated seismic velocities using at least one of:

(A) a function determined independently from the seismic data using regional information;

(B) data from a well corresponding to a specific calibration location that is outside the areal extent of the seismic velocity data; and

(C) data from a well corresponding to a specific calibration location within the areal extent of the seismic velocity data; and

(D) data from a well corresponding to a specific calibration location within the areal extent of the seismic velocity data combined with the velocity data from the seismic survey for the same said location.

29. (new) The machine readable medium of claim 28 further comprising instructions for calibrating the estimated seismic velocities based on estimation of an overburden-depth relationship that is determined by integrating density data from

at least one of:

I. a 1-D density function derived from density logs from at least one well;

II. a 1-D density function derived from density data from drop cores, side-wall cores or conventional cores;

III. a spatially varying density function based on the inversion of potential fields data, said potential fields data comprising at least one of gravity data, and magnetic data;

IV. a density function derived by performing inversion of at least one of PP data, and PS data.

30. (new) The machine readable medium of claim 27 further comprising instructions for estimating the seismic velocities using at least one of:

(A) Dip Move out (DMO),

(B) Pre-stack time migration,

(C) Pre-stack depth migration,

(D) Multiple attenuation or suppression,

(E) Reflection statics,

(F) Refraction statics,

(G) Wavefield reconstruction, and

(H) combining undersampled seismic data from several gathers to form super-gathers.

31. (new) The machine readable medium of claim 26 wherein the parameter of interest is selected from the group consisting of: (i) fluid pressure, (ii) fracture gradient, (iii) overburden pressure, (iv) effective stress, and, (v) excess pressure, defined as the difference between the actual fluid pressure and the normal pressure for the same depth.

32. (new) The machine readable medium of claim 31 further comprising instructions for performing further analysis at one of the following scales:

A. the scale of a specific well location, defined as a projected one-dimensional path that will be used to place a wellbore into the subsurface,

B. the scale of an exploration prospect, and

C. the scale of a regional pressure evaluation to understand hydrocarbon systems.

33. (new) The machine readable medium of claim 31 further comprising instructions for performing specific analyses of the subsurface including at least one of the following:

A. basin modeling,

B. hydrocarbon maturation in source rock intervals,

C. lateral and vertical seal rock integrity,

D. fault seal integrity,

E. evaluation of fluid migration pathways in the subsurface,

F. reservoir-specific lateral pressure changes,

G. shallow water flow risk evaluation, and

H. wellbore stability and failure analysis.

34. (new) The machine readable medium of claim 26 wherein the seismic data is selected from the group consisting of: (i) P-wave land seismic data, (ii) S-wave land seismic data, (iii) mode-converted S-wave land data (land PS data), (iv) mode-converted S-wave marine ocean-bottom cable data (marine PS data), (v) P-wave marine streamer data, and, (vi) P-wave marine ocean bottom cable data (PP data).

35. (new) The machine readable medium of claim 27 further comprising instructions estimating the seismic velocities from the group consisting of:

(A) P-wave velocity data generated from normal moveout (NMO) velocity analysis,

(B) P-wave or S-wave velocity data generated from coherency inversion analysis,

(C) P-wave velocity generated from pre-stack inversion,

(D) P-wave velocity generated from post-stack inversion,

(E) S-wave velocity generated from pre-stack inversion,

(F) S-wave velocity generated from post-stack inversion,

(G) S-wave velocity data generated from normal moveout (NMO) velocity

analysis,

(H) P-wave velocity generated from tomography,

(I) S-wave velocity generated from tomography,

(J) P-wave velocity data from vertical seismic profiling (VSP),

(K) P-wave velocity data from VSP look-ahead inversion,

(L) S-wave velocity data from vertical seismic profiling (VSP), and

(M) S-wave velocity data from VSP look-ahead inversion.

36. (new) The machine readable medium of claim 28 wherein the data from a well comprises at least one of:

I. sonic logs,

II. shear sonic logs,

III. density logs,

IV. Lithology logs in the form of gamma ray or Spontaneous Potential logs, and

V. formation fluid pressure data,

37. (new) The machine readable medium of claim 26 further comprising instructions for implementing at least one of:

(i) the Eaton method,

(ii) the effective stress method, and

(iii) the equivalent depth method.

38. (new) The machine readable medium of claim 27 further comprising instructions for calibrating the estimated seismic velocities using at least one of:

(A) a linear curve fitting,

(B) a curve fitting based on a power law,

(C) a curve fitting based on exponentials, and

(D) a quadratic curve fitting.

39. (new) The machine readable medium of claim 38 further comprising instructions for calibrating the estimated seismic velocities that enable use of an interactive display, the interactive display allowing modification of a displayed calibration curve and observing changes in a plurality of other displayed curves simultaneously, the interactive display further allowing at least one of:

I. manually changing a coefficient or exponent in the fitting equation, and

II. using a cursor to graphically manipulate the fitting curve.

40. (new) machine readable medium of claim 26 further comprising instructions for obtaining a porosity calibration curve using at least one of:

(i) editing of erroneous porosity values for at least one well;

(ii) displaying in a single plot, a depth-correlated porosity and velocity data for the at least one well;

(iii) curve fitting of the velocity and porosity data using at least one of:

I. a linear curve fitting,

II. a curve fitting based on a power law,

III. a curve fitting based on exponentials, and

IV. a quadratic curve fitting.

41. (new) The machine readable medium of claim 26 further comprising instructions fo displaying the parameter of interest on one of:

(i) stacked seismic section, and

(ii) migrated seismic section.

42. (new) The machine readable medium of claim 26 further comprising instructions for enabling display of the parameter of interest interactively and simultaneously on at least one of:

(i) a seismic display;

(ii) a velocity versus depth display including a velocity function for a specific location and a calibration function for velocity versus effective stress,

(iii) a stress versus depth display including the overburden stress calibration for said specific location and the effective stress calculated from the velocity versus depth display,

(iv) a pressure-gradient versus depth display including the fracture gradient or overburden gradient, the fluid pressure gradient calculated from the stress versus depth display, and pressure data points from a well that applies to

said specific location.

43. (new) The machine readable medium of claim 6 further comprising instructions enabling at least one of:

(i) deletion or correction for zones of abnormal velocity caused by the presence of hydrocarbon fluids; and

(ii) deletion of zones of abnormal velocity caused by the presence of nonclastic rocks.

44. (new) The machine readable medium of claim 26 further comprising instructions for at least one of:

(i) determining an overburden stress from a density function based on inversion of 2-D or 3-D potential fields;

(ii) determining an overburden stress from a density function derived by performing a simultaneous inversion of PP and PS data;

(iii) correcting for zones of abnormal density caused by the presence of hydrocarbon fluids by inserting a correct density for said zones and recalculating the overburden at the specific location;

(iv) correcting for zones of abnormal velocity caused by the presence of hydrocarbon fluids by deleting said zones from the calculation of the parameter of interest;

(v) correcting for zones of abnormal density caused by the presence of non-

clastic rocks by inserting a correct density for said zones and recalculating the overburden at the specific location; and

(vi) correcting for zones of abnormal velocity caused by the presence of non-clastic rocks by deleting said zones from the calculation of the parameter of interest.

45. (new) The machine readable medium of claim 27 further comprising instructions for estimation of an overburden-depth relationship that is determined by integrating density data obtained by inversion of 2-D or 3-D potential fields data.

46. (new) The machine readable medium of claim 27 further comprising instructions for estimation of an overburden-depth relationship by integrating density data obtained by inversion of at least one of 2-D or 3-D seismic data, and wherein said seismic data further comprise at least one of PP data and PS data.

47. (new) A computer program executed by a computer for:

(a) accessing subsurface seismic data that is at least one of:

(A) a 2-D seismic line, and

(B) a 3-D seismic volume,

corresponding to a subsurface region;

(b) displaying, editing and datuming a well log associated with the subsurface region and fitting a calibration curve to the log;

(c) predicting fluid and rock pressures in the subsurface region based at least in part on the subsurface seismic data and results of the fitting; and

(d) displaying results of the prediction on a display device associated with the computer.

48. (new) The computer program of claim 47 further comprising instructions for:

(i) identifying a plurality of seismic horizons from the subsurface seismic data;

(ii) obtaining estimated seismic velocities corresponding to at least one interval between at least one pair of said plurality of seismic horizons;

(iii) calibrating the estimated seismic velocities to the parameter of interest

49. (new) The computer program of claim 48 further comprising instructions for:

calibrating the estimated seismic velocities using at least one of:

(A) a function determined independently from the seismic data using regional information;

(B) data from a well corresponding to a specific calibration location that is outside the areal extent of the seismic velocity data; and

(C) data from a well corresponding to a specific calibration location within the areal extent of the seismic velocity data; and

(D) data from a well corresponding to a specific calibration location within the areal extent of the seismic velocity data combined with the velocity data

from the seismic survey for the same said location.